IN THE CLAIMS:

Kindly add the following new claims 39-44 as shown in the following listing of claims, which replaces all previous versions and listings of claims in this application.

1. (previously presented) A method of cross-sectional processing and observation comprising:

a first step of processing at least one predetermined area in a surface of a sample to form a target cross-section by etching the at least one predetermined area with a focused energy beam using a focused energy beam irradiating unit in a vacuum chamber; and

a second step of observing the target cross-section by scanning the target cross-section with a probe of a scanning probe microscope in the vacuum chamber and detecting a physical quantity produced between the probe and the target cross-section.

2. (canceled).

3. (previously presented) The method of cross-sectional processing and observation of claim 1; wherein the focused energy beam is a focused ion beam.

4. (previously presented) The method of cross-sectional processing and observation of claim 3; wherein the first step includes a step of decomposing an organic metal gas with the focused ion beam in a predetermined location of

the sample to make an electrode and an interconnect after carrying out the etching process with the focused ion beam.

5. (previously presented) A method of cross-sectional processing and observation, comprising: providing a system for cross-sectional processing and observation comprised of a processing unit for processing a surface of a sample and a scanning probe microscope unit both disposed in a single vacuum chamber; processing at least one predetermined area in the surface of the sample using the processing unit to expose a target cross-section thereof; and observing the exposed target cross-section by scanning the exposed target cross-section with a probe of the scanning probe microscope unit.

6. (previously presented) The method of cross-sectional processing and observation according to claim 5, further comprising: removing a damaged portion remaining in the exposed target cross-section and then forming a stepped portion according to a difference in materials among layers forming the exposed target cross-section.

7. (previously presented) The method of cross-sectional processing and observation of claim 6; further comprising a step of finishing the exposed target cross-section into a mirror face before the stepped portion is formed.

8. (previously presented) The method of cross-sectional processing and observation of claim 1; wherein the first step and the second step are repeated sequentially.

9. - 30. (canceled).

31. (previously presented) The method of cross-sectional processing and observation of claim 1; wherein the physical quantity is a physical quantity relating to an electric and magnetic solid state property of the sample selected from the group consisting of an electrical conductivity, a dopant concentration, a dielectric constant, a potential, a leaking magnetic field, and a spin interaction of the sample.

32. (previously presented) The method of cross-sectional processing and observation of claim 1; wherein the physical quantity is a physical quantity relating to a mechanical solid state property of the sample selected from the group consisting of a hardness, a friction, and an elasticoviscosity of the sample.

33. (previously presented) The method of cross-sectional processing and observation of claim 1; further comprising the step of observing a position of the probe using a microscope unit and controlling the position of the probe in

accordance with observed information obtained from the microscope unit.

34. (previously presented) The method of cross-sectional processing and observation of claim 33; wherein the microscope unit comprises an optical microscope.

35. (previously presented) The method of cross-sectional processing and observation of claim 33; wherein the microscope unit comprises a scanning electron microscope.

36. (canceled).

37. (previously presented) The method of cross-sectional processing and observation of claim 7; wherein the step of finishing the exposed target cross-section into a mirror face is conducted by irradiating an electron beam in parallel with blowing of etching gas.

38. (previously presented) The method of cross-sectional processing and observation of claim 6; wherein the removal of the damaged portion remaining in the exposed target cross-section and the formation of the stepped portion according to a difference in materials among layers forming the exposed target cross-section are conducted by irradiating an argon beam.

39. (new) The method of cross-sectional processing and observation of claim 1; further comprising the step of etching the target cross-section after the first step and before the second step.

40. (new) The method of cross-sectional processing and observation of claim 39; wherein the step of etching comprises etching the target cross-section using an inert particle beam irradiating unit.

41. (new) The method of cross-sectional processing and observation of claim 39; wherein the step of etching comprises etching the target cross-section using a gas blowing unit.

42. (new) The method of cross-sectional processing and observation of claim 39; wherein the step of etching comprises etching the target cross-section using a laser beam irradiating unit.

43. (new) The method of cross-sectional processing and observation of claim 1; wherein the second step includes the step of processing the surface of the sample by cutting the surface of the sample.

44. (new) The method of cross-sectional processing and observation of claim 1; wherein the second step includes the step of processing the target cross-section by applying a voltage between the probe and the target cross-section to

perform anodization and thereby form an insulating layer on the target cross-section.